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# INTERNATIONAL RESEARCH COOPERATION IN THE BALTIC REGION: A SCIENTOMETRIC ANALYSIS

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*This article examines the processes of international research cooperation in the Baltic Sea region. It focuses on research works published in the leading periodicals in 1993–2012. The empirical material is collected from the world's largest abstract and citation database, SciVerse Scopus, which makes it possible to evaluate macroindicators at the national and global levels as well as the contribution of scholars to the global progress. The article also offers an assessment of the efficiency of research activities in the Baltic Sea region countries. It is based on a number of scientometric indicators that reflect the performance of universities in terms of research journal publications and the development of research cooperation in the field of Baltic studies. The authors consider the dynamics of research contribution and academic cooperation in the Baltic Sea countries in four leading fields — i. e. agricultural and biological sciences, Earth sciences, ecology and social sciences presented in the SciVerse Scopus scientometric database. The article provides a map of research cooperation in the Baltic Sea region.*

**Key words:** Baltic region, scientometric analysis, Scopus, international research cooperation, research publication

The regionalisation of the world, which is intensified by its globalisation, leads to the development of cooperation in various spheres in the countries, which aspire to improve their position in the world economy. The Baltic region belongs to the microregions that are constantly increasing the use of international cooperation resources in order to improve competitiveness of cooperation participants in the world arena [10, c. 48]. Each year, the region becomes increasingly open to international economic and research cooperation. Prof A. P. Klemeshev emphasises that “having considerable and fast growing innovation potential, the Baltic Sea region is of great interest for Russia and the EU in terms of developing cooperation in generating and introducing innovations. In this connection, research works aimed at exploring possibilities for cooperation and areas of common interest

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are gaining importance” [10, p. 52]. The Baltic Sea region has always been an important area of study for research community. Before the 1990s, scholars focused on research in such field as oceanology, geology, ecology, etc. However, today they are paying more attention to the issues of international cooperation, economic development, politics, education and culture. International research cooperation is actively developing, which is manifested in stable contacts with international partners. In this respect, the number of joint publications of scholars coming from different countries is an important indicator.

This work aims to analyse a level, development dynamics, specialisation and geography of international research cooperation in the Baltic region by examining research publications.

Scientometric studies are popular both in Russia and abroad. The most influential scholars in this field are as follows: D. Price [p.22—25], who laid the foundations of the discipline; E. Garfield [p.30—37], who formulated the basic principles of theory of citations; H. G. Small [p.38—41], who developed the concept of a co-citation cluster. This study is also based on theoretical findings of Russian scholars: Yu. V. Granovsky [3—4], G. F. Gordukalova [5—9], Z. N. Mulchenko [17—18], V. A. Markusova [12—14], I. V. Marshakova-Shaikovich [15], V. V. Nalimov [18], V. V. Pislyakov [21; 42], V. M. Tytynnik [29] and O. V. Penkova [19—20].

As a source of empirical material, we used the world’s largest abstract and citation database (DB), Scopus. It contains more than 45m publications (as of May 2012) [27, p. 7—9]. The research methodology suggests a consistent scientometric analysis of such aspects as the number of research publications by scholars from Baltic Sea region states, study of the Baltic region as an area of research and the level of research cooperation development.

Publications on the Baltic region (search queries “Baltic region”, “Baltic Sea area”) found in the Scopus database relate predominantly to the following sciences: Earth sciences (32 %), ecology (18 %), agriculture and biology (17 %), and social sciences (7 %).

On the basis of the four primary research fields, we analysed outputs of research papers by the Baltic Sea region scholars. Firstly, one should emphasise an increase in the number of articles on regional issues — in 1993—2011, this number grew more than eightfold (fig. 1).

The activity of scholars in the Baltic Sea region in terms research journal publications is highly differentiated. According to Scopus, 8 research works were published per 100 Russian scholars in 2010; in Sweden, this rate is more than 6 times as high<sup>1</sup>. Unfortunately, Russian publications also have a lower citation level (fig. 2), which is explained by a number of factors: a small number of works published in the English language, low awareness of Russian scholars of research works by their foreign colleagues, lack of references to Russian universities/research institutions in research papers written by Russian scholars who work abroad.

The mean value of the citation index per one publication of the Baltic Sea region scholars is 1.44 (2010); whereas, the world average is 1.24. In this regard, the research communities of Scandinavian countries and Germany are the leaders.

<sup>1</sup> Ibid.

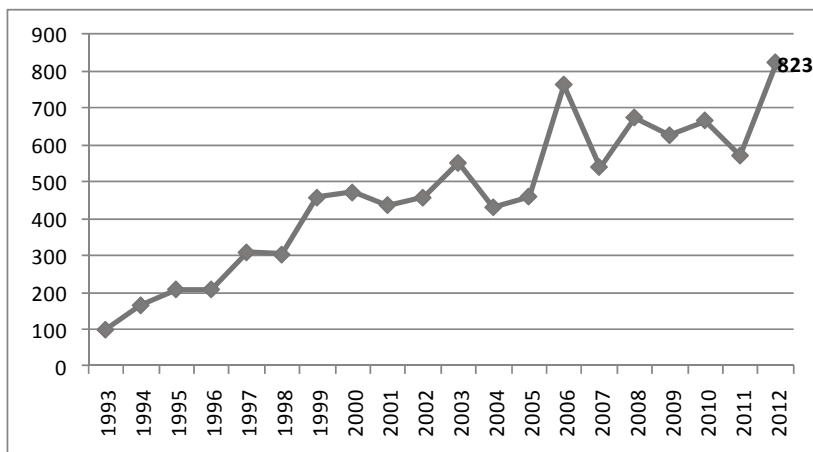


Fig. 1. The number of research publications prepared by Baltic scholars in four primary research fields (Earth sciences, ecology, agriculture and biology, and social sciences) dedicated to regional issues, 1993—2011<sup>2</sup>

An analysis of the total value of the Hirsch index, which makes it possible to assess the weight of a country in research, shows that the leading countries are Germany, Russia and Poland. These countries rank fourth, sixteenth and twentieth respectively, according to the 2010 SCImago Journal & Country Rank that offers annual statistics on the number of publications and citations by journals and countries on the basis of the Scopus DB information and is available on the SCImago Journal & Country Rank analytical portal. A share of the Baltic Sea countries in the world value of the Hirsch index almost equals the total number of publications and amounts to almost 11 % (fig. 3).

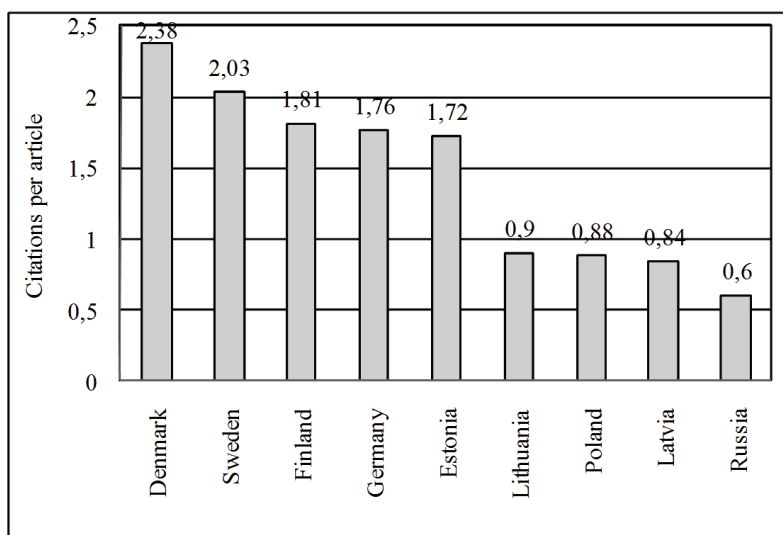


Fig. 2. The average level of citation per article (all research fields in the Scopus DB) in the Baltic Sea region<sup>3</sup>

<sup>2</sup> Compiled by the authors, based on: *The SCImago Journal & Country Rank*. URL: <http://www.scimagojr.com/index.php> (accessed on 20.08.2012).

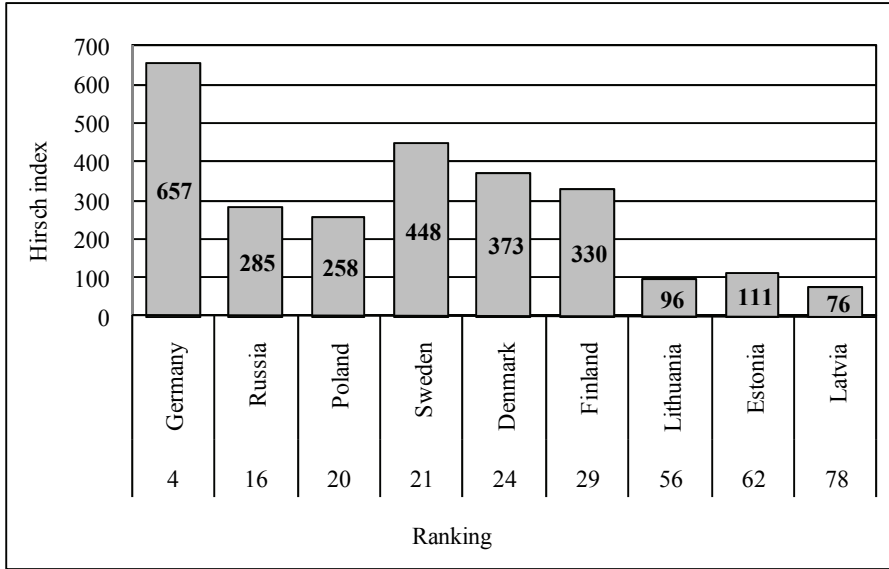


Fig. 3. Hirsch index in the Baltic macroregion countries<sup>4</sup>

Thus, the evaluation of efficiency and productivity of scholars in the Baltic Sea region performed on the basis of bibliometric indicators shows that the leaders in this respect are Germany, Denmark and Scandinavian countries. This result is indicative of a general level of research, and technological and innovative development of these countries. It is confirmed by a number of works [1; 16] offering a complex analysis of this field as they also name these countries as leaders.

An important research area is the Baltic Sea region itself. It is studied by various science specialists — more than 150 international research journals regularly publish articles dedicated to this region.

On the basis of scientometric indicators, we analyse research articles by the Baltic Sea region scholars who study this region within the above-mentioned four principal research fields (fig. 4).

One can identify three groups of countries in the Baltic Sea region according to research publication outputs. The first group brings together Germany, Sweden and Finland (26—17 %); the second group includes Denmark and Poland (15—11 %); the third “outsider” group consists of Russia and the Baltic states (10 — less than 5 %). Germany’s leading position is explained by a high level of scientific development in general and public interest in expanding Germany’s political and economic presence in the macroregion. As early as 2006, Chancellor G. Schröder called the Baltic Sea region a “laboratory for Europe” in his speech on the occasion of the German presidency in the Council of the Baltic Sea States [2].

<sup>3</sup> Compiled by the authors, based on *The SCImago Journal & Country Rank*.

<sup>4</sup> Ibid.

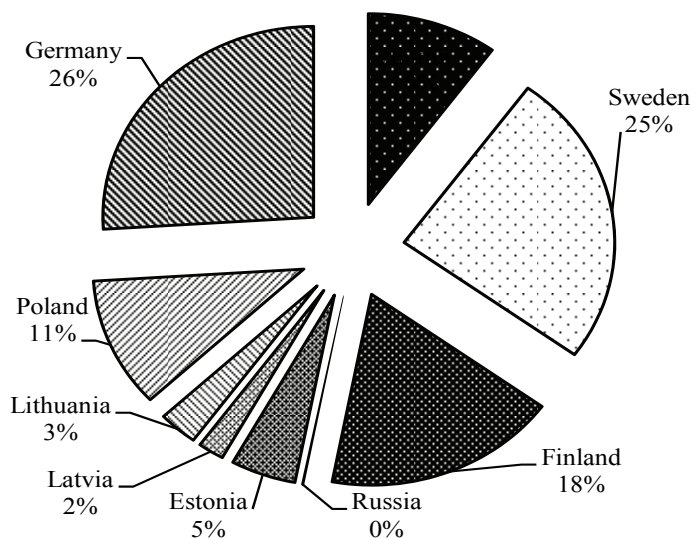


Fig. 4. The share of research publications on regional issues by the Baltic Sea region scholars in 1993–2012.<sup>5</sup>

**The Russian Federation ranks third in the SCImago Journal & Country Rank;** however, among the countries, whose scholars pay close attention to the problems of the Baltic Sea region and publish their research results in research journals, Russia is poorly represented. As to the four principal fields of research on the Baltic region, the Scopus DB offers information only on 12 publications by Russian scholars. This number requires further comments. It is a matter of history that in the Russian Federation most studies are conducted in the field of exact sciences. It is shown on the diagram demonstrating thematic distribution of Russian scholars' research in 2011 (it largely coincides with long-term trends) (fig. 5). However, the study of the Baltic Sea region belongs, primarily, to such research fields as agriculture and biology, Earth sciences, ecology and social sciences.

Since 2000, Russia launched a number of transborder cooperation programmes in the Baltic Sea region [11]. In the nearest future, our scholars will receive an additional impetus for conducting regional studies. According to the Zaks. ru informational portal, the European Parliament plans to allocate €100m for studying the Baltic Sea region [28]. And, finally, in July 2012, the Russian Federation took over the CBSS presidency from Germany. All these factors must positively affect the number of studies on the Baltic region and result in the growth of research papers written by Russian scholars.

The information available at the SCImago Journal & Country Rank analytical portal also makes it possible to assess international research cooperation of the Baltic Sea region countries and analyse the articles authored by international collaborators (fig. 6).

<sup>5</sup> Compiled by the authors, based on *The SCImago Journal & Country Rank*.

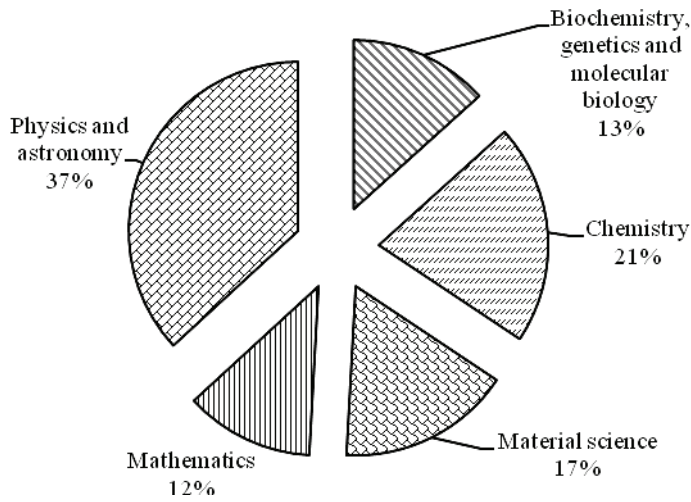


Fig. 5. Fields of scientific research undertaken by Russian scientists, 2011<sup>6</sup>

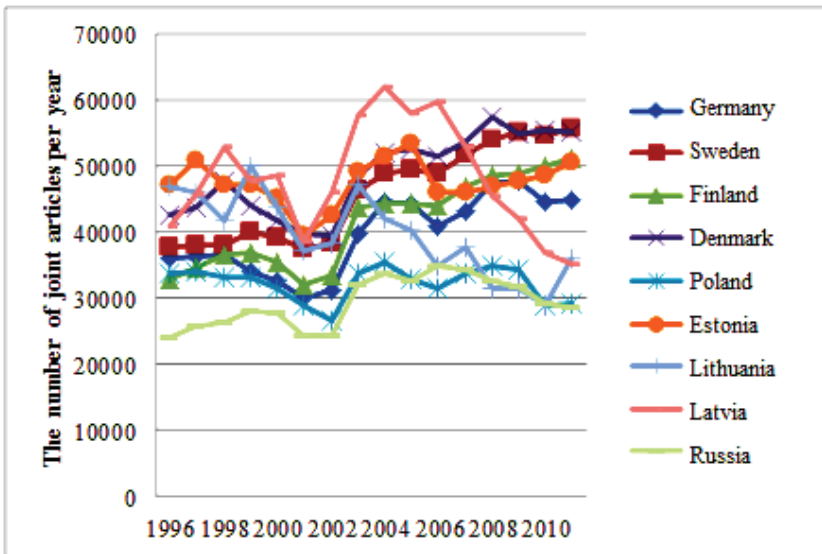


Fig. 6. The number of articles written by international teams of authors from the Baltic macroregion countries, 1996—2011<sup>7</sup>

<sup>6</sup> Compiled by the authors, based on *The SCImago Journal & Country Rank*.

<sup>7</sup> Compiled by the authors, based on *The SCImago Journal & Country Rank*.

The figure shows that the largest number of articles written in collaboration was published by scholars from Latvia, Denmark and Sweden. The second group brings together Estonia, Finland and Germany; the third group includes Lithuania, Poland and Russia.

The fact that Finland and Germany are found in the second group can be explained by an optimal combination of domestic author resources, the level of research potential development and an extensive network of international contacts. The mentioned factors allow these countries to occupy top positions both in terms of the number of publications and citation indicators (see fig. 2). In their turn, Latvian scholars actively look for international co-authors. As a result, 73 % of a total of 39,005 articles found in Scopus in 2011 are written in collaboration.

A different situation is observed when analysing the publications by the Baltic Sea region scholars written in collaboration and devoted to the Baltic Sea region (the four principal research fields).

Germany, Denmark and Sweden have the best developed international contacts; the lowest positions in this respect are occupied by Finland, Poland and Estonia. Scientists from post-Soviet countries (Russia, Lithuania and Latvia) rarely attract international scholars as co-authors for articles on the Baltic issues (fig. 7). In Russia, it is explained by the fact that public policy in science and innovation is primarily orientated at the natural science. In addition, the problems of macroregions are rather poorly studied [26]. Integral research on these problems is conducted at the Immanuel Kant Baltic Federal University, the International Centre for Social and Economic Research — Leontief Centre, the Centre for Comprehensive European and International Studies, European University in Saint Petersburg, the Institute of World Economy and International Relations, Saint Petersburg State University, the Russian-Baltic Centre of the Institute of Sociology of the Russian Academy of Sciences and some other institutions.

As Figure 7 shows, the most intensive development of research ties is observed between German scholars, and those from Denmark, Sweden and Finland, which is explained by high scientific and technological potential of Germany in the macroregion. Stable research connections are characteristic of Finland, Denmark, Sweden, Germany and Estonia. In 2011, Lithuania and Latvia did not publish any joint works that were registered in the Scopus databases. Russia has the strongest research ties with Germany and Finland. It is worth emphasising that in 2000—2010 the number of joint research articles on the Baltic region increased by 10 %.

It can be concluded that the Baltic Sea region countries are characterised by significant differentiation in the outputs of research publications, which corresponds to their scientific and technological development potential in general.

The Baltic region is an important research area (especially, for geographers, environmental scientists and biologists); however, joint research carried out by the Baltic Sea region scholars results in a limited number of publications dedicated to this topic. The most active cooperation is observed in Germany, Denmark and Sweden, which is explained by a number of factors, for instance, common usage of the English language as a means of scientific communication, absence of political barriers in the past and a long history of cooperation in various spheres.



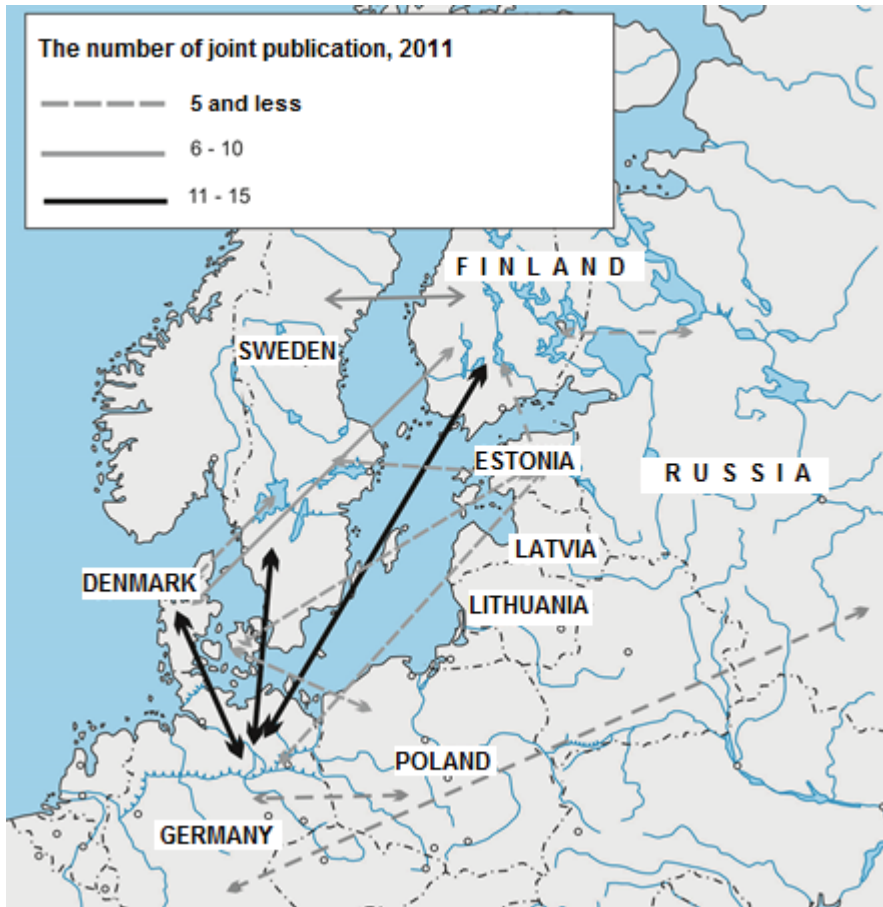


Fig. 7. International research cooperation in the field of Baltic Sea region studies, 2011<sup>8</sup>

The improvement of Russia's standing in the Baltic Sea region requires further development of international cooperation, including the field of education and science.

Closer cooperation of Russian scholars with international colleagues in the Baltic region studies requires stronger ties between research institutions and editorial boards of international journals, the improvement of existing Russian journals on regional problems and the establishment of new ones, their further inclusion in international abstract and citation databases, active participation of Russian scholars in international conferences and package measures aimed at improving the command of the English language. EU cross-border cooperation programmes can serve an efficient tool for activating joint research on the Baltic Sea region among scholars from the Scandinavian countries, Germany, Poland and the Baltic states. Other tools can include the development of research cooperation with the Council of the Baltic Sea States, participation in research and education projects, and preparation of new ones.

<sup>8</sup> Compiled by the authors, based on *The SCImago Journal & Country Rank*.

Further development of research cooperation in studying the Baltic Sea region is an important aspect of sustainable development of this macro-region. It contributes to an increase in the quality and competitiveness of national research and education systems.

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